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METHOD OF CONSTRUCTING A QUARTERLY INDEX OF LAND PRICES FOR SELECTED COUNTIES

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METHOD OF CONSTRUCTING A QUARTERLY INDEX OF LAND PRICES FOR SELECTED COUNTIES

There is need in the quarterly land market work in the Northern Great Plains States for a more adequate statistical measure of farm real estate price trends in each of the "land market" counties. The field workers, of course, do get a general picture of the situation in each county from conversations with local people, but it is difficult to synthesize a small number of local opinions into statistical trends. The average sales price per acre for each quarter can be computed from the real estate transfer schedules, but only limited use can be made of average sales prices, because it is generally impossible to tell from the average price alone whether there is any change in the quality of land being sold.

The purpose of this memorandum is to describe a method by which the ratio of sales prices to assessed values can be used to construct a quarterly index of land prices for each county. So far, this method has been used to construct index series for 10 of the 23 land market counties. 1/ Eventually, similar series may be computed for other counties. This method tends to eliminate the effects of changes in quality of land being sold and therefore should be useful as a statistical measure of price trends.

Need for a "Yardstick" Against Which to Measure Price Changes

County average sale prices for each quarter appear to provide a fairly good index in those counties which are comparatively uniform as to quality of land, such as Clay County in southeastern South Dakota or Haskell County in southwestern Kansas. On the other hand, in counties where there is a wide variation in the quality of land, the average price per acre may be very misleading, because even small changes in the proportion of the high value or low value land being sold from quarter to quarter may result in violent fluctuations in the average sales price without reflecting the real trend in price.

This is illustrated by the situation in Goshen County, Wyoming, which contains a wide variety of land classes and

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1/ The price movements, as shown by these series, are described in "Index of Farm Real Estate Prices, Selected Counties in the Northern Great Plains States," Research Memo. No. 18, Division of Land Economics, BAE, Lincoln, Nebr., Feb. 1944.

grades, with an extreme range in price of from less than $1 per acre for the lowest quality grazing land to over $120 per acre for some of the better irrigated land. The average price of land sold in this county has fluctuated widely during the period covered by the land market survey. For some quarters, the average is less than $5 per acre while for other quarters it is over $11 per acre. These variations are not due so much to changes in the prices of any class or grade of land as to changes in the proportions of irrigated land, dry farming land and grazing land sold each quarter. Until the last quarter of 1943, local people consistently told the fieldmen that no great changes in the market price of the land had occurred in this county.

Obviously, what is needed in cases of this sort is a "yardstick" against which changes in prices may be measured.

Ratio of Sales Price to Assessed Value as a Measure of Price Trends

The "yardstick" or standard value upon which a land price index is based, should reflect, as nearly as possible, the price relationships which exist among tracts of various kinds of land; for example, between "hard" land and sandy land, between irrigated land and dry land, between bottom land and terraces, or between crop land and grazing land. Also, the standard value should not change throughout the entire period to be covered by the index. Assessed valuations are used as the standard value for the computation of the index described in this report, not because assessments are considered an ideal standard, but because no other set of appraisals is available. Assessments for the 1942 tax year are used primarily because these were the latest available at the time this aspect of the land market study was started. Then, too, the 1942 quarterly average was selected as the base period for the index.

The first step in the construction of the land price index for a county is to compute the average ratio between sales prices and the assessed values for each quarterly period. These ratios are then converted to index numbers by the usual procedure of dividing each ratio by the average ratio for the base period. This may be illustrated by an extremely simplified example in which the trend in price is determined from the sales prices and assessed values of only 2 tracts, the sales occurring in the different time periods. Tract A sells for $10,000 in 1942 and Tract B sells for $8,000 in 1943. The

assessed values of these 2 tracts are $9,000 and $7,500 respectively. The 1942 ratio of sales price to assessed value, as evidenced by Tract A, is 1.111 (i.e., 10,000 ÷ 9,000) and the 1943 ratio, as indicated by Tract B is 1.067 (i.e., 8,000 ÷ 7,500). These ratios, converted to index numbers with a 1942 base, are 100 for 1942 and 96 for 1943.

Of course, it would be poor statistical procedure to base a land price index on only 1 isolated sale per year. As a rule, it is desirable to base the index on as many sales as possible (i.e., all the bona fide voluntary sales for which the full consideration and assessed values are known) because the larger the statistical sample, the smaller will be the probable error. The procedure for computing the average ratios and indexes from a number of sales may be illustrated by adding sales tracts C, D and E to the previous example. Basic data are assumed to be as follows:

Year of sale	Sales tract	Sales price	Assessed value
1942	A	$10,000	$ 9,000
	C	12,000	11,500
1943	B	8,000	7,500
	D	7,000	6,500
	E	10,000	8,000

The total sales price of the 2 tracts sold in 1942 is $22,000 and their total assessed value is $20,500, which gives an average ratio of sales price to assessed value of 1.073. The total sales price of the 3 tracts sold in 1943 is $25,000 and their total assessed value is $22,000, which gives an average ratio of 1.136. The index numbers computed from the ratios, using 1942 as a base, are 100 for 1942 and 106 for 1943.

Assessment Inequalities

There are serious objections to the use of assessed valuations as a measure of land quality. Every assessment study which has been made in the Plains has shown assessments to be seriously inequitable, which is just another way of saying that assessed valuations do not measure land quality very accurately. It is believed, however, that 2 factors justify their use: (1) some inequalities among assessments tend to balance out each other, quarter by quarter, especially if the sample (i.e., the number of sale tracts for which full consideration is available) is fairly large; and (2) statistical

adjustments can be made to offset certain types of assessment inequality.

Various assessment studies have isolated 3 types of inequality among farm real estate assessments: (1) those due to variations in the general level of assessment from taxing unit to taxing unit; (2) those due to a different level of assessment being used for improvements than is used for land; and (3) those due to undervaluing certain types of land and to overvaluing others.

Adjustments to Compensate for Assessment Inequalities

Inasmuch as separate indexes are constructed for each county, assessment inequalities of the first type are significant only in those states, such as the 2 Dakotas, where the township rather than the county is the basic unit for assessment. In such states, the general level of assessment varies from township to township, depending upon the need for local revenue and upon the differences in opinion among the local assessors. The larger the sample, of course, the greater the tendency for these inequalities to balance out each other. The only procedure used to adjust for this type of inequality is to discard from the sample any tract on which the assessment ratio is badly out of line with the ratios for other tracts during that particular quarter. This is not entirely satisfactory, however, because in some cases it may mean "pruning down" a sample already too small.

Inequalities of the second type stem from the almost universal practice of assessing farm improvements at only a small fraction of their actual work, regardless of whether the land itself is overassessed or underassessed. Farm improvements, moreover, are legally tax-exempt in North Dakota, although some observers point out that the quality of improvements may influence individual farm assessments to a great extent, because local people commonly accept the quality of improvements as an indication of the quality of the land. 2/ So far, no attempt has been made in the construction of the land price indexes to eliminate the effect of the underassessment of improvements, on the assumption that inequalities of

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2/ This, of course, would not be true in a county, such as Morton, which uses the land classification method of assessment.

this type would tend to average out. If further study indicates that adjustments should be made, the procedure would be to construct two separate index series, one for tracts containing farmsteads and other improvements of comparatively high value, and one for tracts on which improvement values are negligible.

Assessment inequalities of the third type are due primarily to the almost universal practice of overassessing poor land and underassessing good land. The extreme example of this is found in certain South Dakota counties, where apparently it is a common practice for the local assessor to list practically all tracts within his township at the same value per acre, regardless of quality of land or actual value of of the property. 3/ This lack of enough difference in assessed value between good and poor land may also exist in states, such as Colorado and Montana, where the land classification and grading system of assessment is used. In counties of these states, the inequalities arise not only from the lack of sufficient "spread" in the basic scheduled values for each grade and class, but also from the general tendency to classify land, which is near the margin between 2 economic use classes, into the higher economic use. Thus, there are thousands of acres of grazing land that are classified and valued as "dry farming" on the assessment rolls.

The method used to adjust for this type of assessment inequality is to "stratify" each quarterly sample by dividing it into a number of groups according to the percentage of crop land in each tract as shown by the AAA records and to construct separate primary series of index numbers for each group. These separate series are then averaged into a single final series by weighting according to the acreage of land in each group for the current quarter and also according to the quarterly average acreage sold in 1942, the base year.

For the counties in the western and northern part of the region, the groupings for which primary indexes are constructed are as follows: 60 percent or more cropland, 30 to 59 percent cropland, 10 to 29 percent cropland, and less than 10 percent cropland. In the Nebraska and Kansas counties, the cropland groupings are as follows: 80 percent or more, 60 to 79 percent, 40 to 59 percent, and less than 40 percent. No significance is attached to these particular ranges, nor is there any

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3/ Anderson, Norris J., "Assessment Procedure and Problems in South Dakota," S.D. Agr. Expt. Sta. Bul. No. 355, August 1941, Figure 3.

inherent error in the use of 2 sets of ranges to stratify the quarterly samples in the various counties. These ranges are selected primarily because they tend to split up the quarterly samples into reasonable uniform groups with at least a few sales in every group for practically every quarter.

The geometric mean rather than the arithmetic mean is used to average the primary indexes into a single index, because ratios rather than cardinal numbers are being averaged. Since the primary ratios are "cross weighted" according to the acreage for both the current quarter and the quarterly average during the base period, the mathematical computations for the land price index are somewhat involved.

Adjustments for Sales of County Land

Where the sales of county tax-deed tracts comprise an important part of the land market, as is the case in many counties in Montana and in the western part of the Dakotas, the construction of the land price index becomes even more complicated. The sales prices of county land must not be averaged in directly with sales prices of land of other types of owners, because the county land usually sells at a much lower price per acre than privately-owned tracts of comparable quality. Hence, a change in the proportions of county land in any quarterly sample would result in an increase or decrease in the index even though there were no changes in the price of either county land or privately-owned land. 4/ Furthermore, full consideration is

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4/ There are a number of reasons why county tax-deed land sells at such low prices, the most important of which is the fact that a tax deed is not a very strong title and most buyers, in accepting such deeds, realize that they must either clear title through the courts or run the risk of losing title to the original owners because of possible flaws in the tax deeds. Then, too, most counties do not attempt to "feed the market," but instead make a standing offer to sell any or all county tracts for their minimum prices at any time. Since the counties are more interested in getting the tracts back on the tax rolls subject to current taxes than they are in getting the full value for each tract, the minimum values usually are set very low, in some counties at only 50¢ or $1 per acre. Because of the large number of tracts being offered, competition among buyers raises the selling price above the legal minimum price on only a few tracts.

known on over 95 percent of the county sales, but on only about 55 percent of the sales of privately-owned land, which means that if county sales are averaged in directly with sales of privately-owned land, a disporportionately heavy weight would be given to county land.

Although sales prices of county land should not be averaged in directly with prices of privately-owned land, county land cannot be ignored entirely because it forms such an important part of the land market in some areas. In some counties, the average sale price of tax-deed land has increased due to the fact that the county commissioners increased the minimum sales prices from 50¢ or 75¢ per acre to $1 or more per acre. Even in counties where minimum sales prices have not been increased, there has been an increase in the average sales price of county land because of the general tendency for the better tracts to have been selected in the earlier quarters, which means that poorer tracts are now being sold at the same minimum price.

In order to give county sales their proper consideration in the land price indexes without running the risk of upward and downward bias in the index due to changes in the proportions of county land in the quarterly sample, separate indexes are constructed for county land and for land owned by all other types of owners, according to the same procedure described in the preceding section. These are then averaged into a single land price index series. Again, the weighted geometric mean rather than the arithmetic mean is employed. Weighting, however, is in accordance with a total acreage in the 2 ownership classes sold during the current quarter only; that is, "cross weighting" is not used. Total acreage in this case includes not only the tracts for which total consideration is given on the field schedules, but also those voluntary sales for which only nominal consideration is given.

Variations in Methodology for Certain Counties

Although in general, the computation of the land price index for each county follows the procedure outlined previously, certain deviations are made in some of the counties because of local conditions or peculiar limitations of available data.

Dickinson County, Kansas.- No deviation from the standard procedure is made for this county, except that no allowance is made for sales of county land.

Haskell County, Kansas.- The sample of sales tracts is not stratified for this county, because such a large majority of them fall into one group, namely, the one with more than 80 percent cropland. In cases of this sort, stratification would have no appreciable effect on the index numbers. There have been no sales of county land in this county. Because of these factors, the index for Haskell is computed directly from the quarterly average ratios of sale prices to assessed valuations.

Fallon County, Montana.- No deviations from the standard procedure are made for this county. Sales of county tax-deed land comprise a very important part of the land market in this county, accounting for 43 percent of the acreage of all voluntary sales since October 1, 1940.

Judith Basin County, Montana.- No deviations from the usual procedure is made for this county. Although adjustments are made for county tax-deed land, this type of land has much less effect on the land market in Judith Basin County than in Fallon County, since sales of county land have accounted for only 12 percent of the acreage of all voluntary sales.

Deuel County, Nebraska.- No deviations from the standard procedure are made for this county, except that no adjustments need to be made for county land.

Lancaster County, Nebraska.- The land price index for this county is constructed from the average ratio of sales prices to assessed valuations without any adjustment for possible assessment inequalities, because no satisfactory procedure for stratifying the quarterly samples has been found. The percentage of cropland is ineffectual for this purpose because the vast majority of the tracts have about the same proportion of cropland. On the other hand, there are wide variations in quality of land in this county due to difference in soil type and topography and it is quite likely that this has resulted in as much inequality among assessments as exists in other counties. To base stratification of the quarterly samples on soil type or topography, however, would be a time-consuming task. For these reasons, the index for Lancaster County probably is influenced more by assessment inequalities than is the case with most of the other counties, and hence it may be somewhat less reliable.

Brown County, South Dakota.- This is another county for which the land price index is constructed from the average

ratio of sales prices to assessed valuations without any adjustment for possible assessment inequalities. The percentage of cropland probably would provide a satisfactory basis for stratifying the quarterly samples, but these figures are readily available for less than half of the sales tracts, because of local peculiarities of the county AAA records. County land sales have accounted for only 3 percent of the total acreage sold during the period covered by the land market survey and hence, a separate index for county land need not be computed.

Clay County, South Dakota.- The land price index for this county is computed directly from the quarterly average ratios of sales prices to assessed valuations. The percentage of cropland is an inappropriate basis for stratifying the quarterly samples in this county. It is possible that the quality of land is uniform enough so that stratification is unnecessary. Only a few tracts of county land have been sold in this county.

Haakon County, South Dakota.- No deviations from the standard procedure are made for this county. County land comprises an exceedingly important part of the index, since county tracts have comprised over half of the acreage of all voluntary sales. It is impossible to distinguish between school fund loan foreclosure farms sold by the county and county tax-deed tracts, although it probably would be desirable to eliminate the former from the county land index.

Goshen County, Wyoming.- Two minor deviations from the standard procedure are made in the construction of the index for this county. The assessment classifications are used to determine the cropland acreage on a few tracts for which AAA data are not readily available. Then, too, a primary index is constructed for an additional grouping, which contains all tracts for which the assessment classifications show any irrigated land. Separate indexes are computed for privately-owned and county land because the county land is characterized by low prices, even though county tax-deed land accounts for only 4 percent of the acreage of all voluntary sales.